Rock Chips
Winter 2008

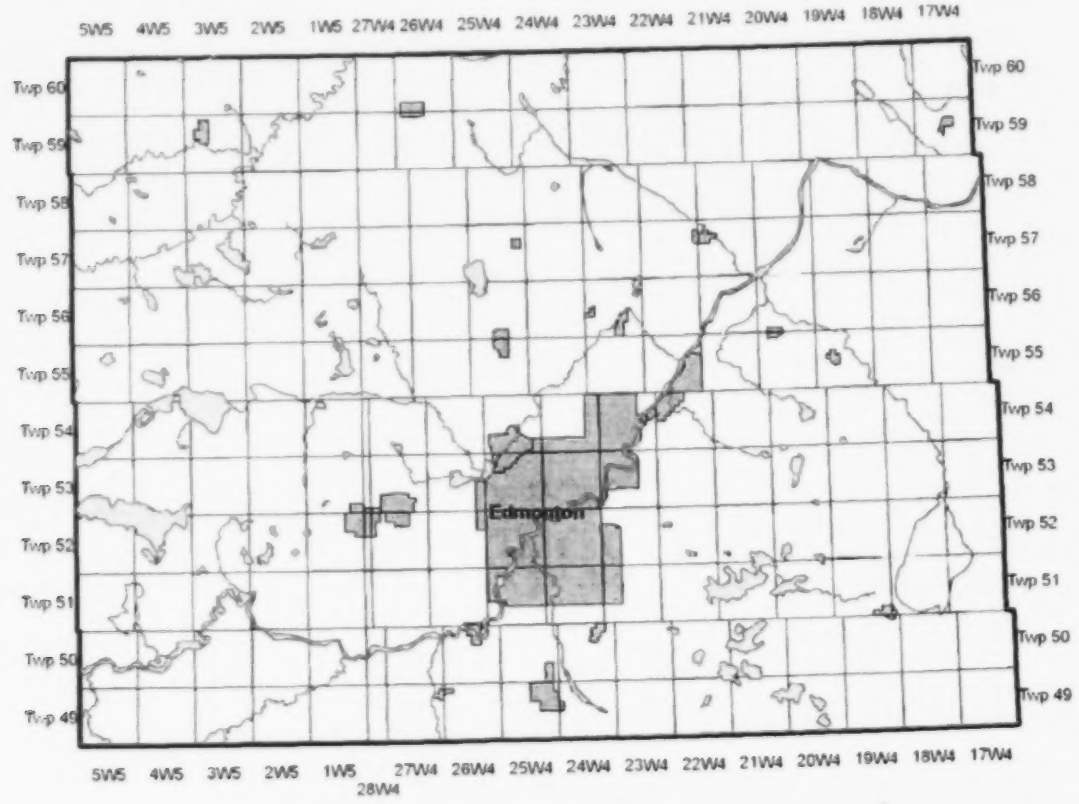
Alberta Geological Survey

AGS Begins Regional Saline-Aquifer Mapping in Alberta's Industrial Heartland

The Government of Alberta's Climate Change Strategy includes a commitment to implementing carbon capture and storage technology in Alberta's energy industry (www.environment.alberta.ca/2430.html.) To this end, the government has recently announced $2 billion in funding toward technology development and demonstration of safe carbon capture and storage (CCS) projects in Alberta. As part of Alberta Geological Survey's role in providing public geoscience to Albertans, we are undertaking regional mapping of saline aquifers in the deep subsurface below the Alberta Industrial Heartland, centred near Edmonton.

The goal of the AGS Saline Aquifer Mapping project, or SAM for short, will be to provide public-domain, digital maps of the major saline aquifers from the crystalline basement to the lowermost aquifer of the Colorado Group. The aquifers will be mapped in terms of

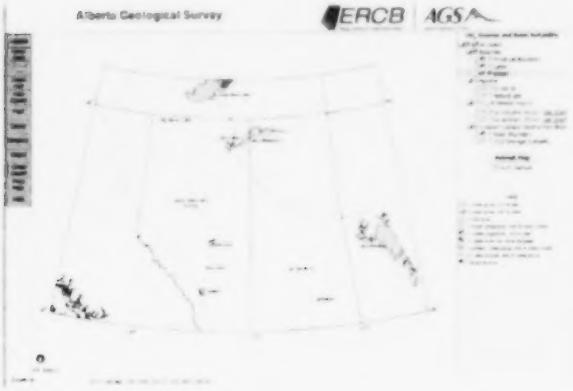
- extent, thickness, lithology, geology, porosity and permeability;
- groundwater chemistry, pressure, flow and age;
- temperature and geothermal energy potential;
- potential for future water production or storage; and
- intrinsic capacity to safely store liquid or gaseous wastes, like CO_2, over long periods of time.

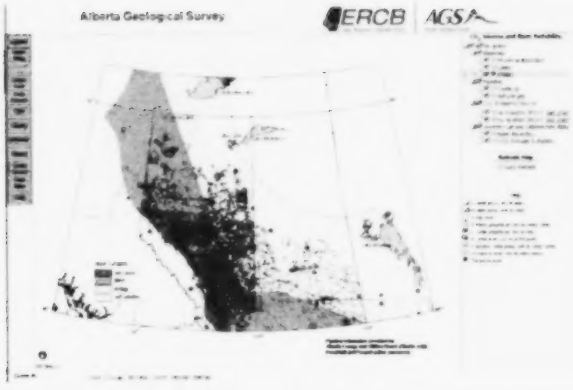


ERCB Energy Resources Conservation Board | AGS Alberta Geological Survey

The SAM project will complement the growing list of government, university and industry-sponsored projects now active or proposed in support of CCS development. Those studies aim to evaluate site-specific conditions at test sites or near current large CO_2 emitters. Regional-scale studies like SAM, which only a geological survey can provide, show the big picture so regulators and policy makers can best guide waste generators to the best disposal options while avoiding consequential losses of future geothermal or groundwater resources.

The SAM project builds upon our experience in evaluating the Alberta Basin's general suitability for CO_2 sequestration, as well as completion of a series of hydrogeological evaluations of acid-gas disposal sites in Alberta and B.C. – direct analogues to large-scale CCS projects with decades of safe operation and experience. ❖





CO_2 sequestration web application www.ags.gov.ab.ca/website/co2/viewer.htm.

Rock Chips is published four times a year by the Alberta Geological Survey in the spring, summer, fall and winter.

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Past and present issues of *Rock Chips* may be viewed on the AGS website at www.ags.gov.ab.ca.

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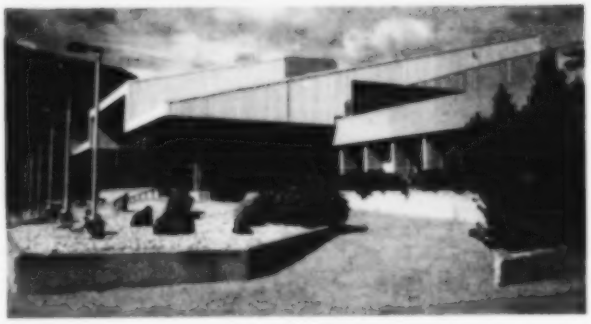
Most reports can be downloaded for free from our website at **www.ags.gov.ab.ca.**

Clients in the Calgary area may view AGS publications at the Energy Resources Conservation Board Library, 640 - 5th Avenue SW Tel: (403) 297-8242.

AGS Helps Re-Open the Frank Slide Interpretive Centre

August 29, 2008 marked the grand re-opening of the Frank Slide Interpretive Centre (FSIC) in the Crowsnest Pass in southwestern Alberta. After a nine-month closure and a $1.5 million renovation, visitors can relive the Frank Slide story in a more personal, interactive and creative setting, involving first-hand accounts by the people who lived through the destruction.



After a series of speeches by government officials and FSIC staff, the Honourable Lindsay Blackett, minister of Culture and Community Spirit, officially opened the facility. A number of AGS staff members were also on hand for the official opening, discussing the new exhibits with visitors and making presentations on the AGS-led monitoring of Turtle Mountain.

Alberta Geological Survey staff provided significant scientific input to the exhibits on the geology and monitoring of the mountain. To tell the story of the building of Turtle Mountain and highlight the factors that led to the 1903 Frank Slide, an interactive, high-definition video was created to illustrate the geological history of the last 100 million years in southwestern Alberta. For this exhibit, the video links to a sliding bar that people can move to advance through the geological time scale and learn about the geology and mountain building at their own pace.

AGS staff member Corey Froese tries out one of the new interactive displays and tries to 'make the mountain tip, dip or slip.'

Adjacent to the geology exhibit are four stations that highlight the AGS-led monitoring program on Turtle Mountain. Visitors are first invited into a theatre area where a video presentation features AGS staff describing the landslide hazards on Turtle Mountain and the types of monitoring we're doing. The visitors are then taken to another part of the exhibit that describes the instruments on the mountain. This has a series of hands-on displays letting visitors 'test their strength' by moving blocks of rock. These displays show how movements and vibrations are measured on the crest of the mountain. Finally, there is a kiosk that provides direct access to Alberta Geological Survey's Turtle Mountain monitoring web pages, where visitors can see photos of the instruments and read about the studies we are undertaking on the mountain.

Overall, the opening was very well attended with more than 850 visitors on the opening day and more than 2100 visitors on the opening weekend. The new, modern displays and hands-on activities were very well received by visitors of all ages.

AGS is pleased to have worked with the staff at the FSIC and Alberta Culture and Community Spirit, and various contractors to bring the new exhibits to life. ❖

New GIS Data Available

As project staff members complete new geological studies, they frequently incorporate historical data into their work, including digitizing existing maps. Whenever possible, we publish these digital data for others to use. We recently published the two GIS datasets described below.

Alberta Lake Bathymetry Data

Below is a list of Alberta lakes with links to digital bathymetry data. Data were captured from historical hydrographic survey maps that were digitized and digitally modelled to produce a continuous surface for each lakebed. There are 3 datasets for each of the 169 lakes: shoreline contours, bathymetry contours (both shapefiles) and ASCII lakebed grids.

Amisk Lake	Eden Lake	Lac la Nonne	Pinehurst Lake
Angling Lake	Elkwater Lake	Lac Saint Cyr	Red Deer Lake
Antler Lake	Ethel Lake	Lac Sante	Reita Lake
Arm Lake	Fawcett Lake	Lac Ste. Anne	Rock Lake
Astotin Lake	Pickle Lake	Laurier Lake	Sameon Lake
Baptiste Lake	Floatingstone Lake	Lawrence Lake	Sandy Lake
Bassano reservoir	Fork Lake	Lee Lake	Sang Lake
Battle Lake	Freeman Lake	Lesser Slave Lake	Seibert Lake
Bear Lake	Frog Lake	Little Beaver Lake	Shiningbank Lake
Beauvallon Lake	Gap Lake	Little McLeod Lake	Skeleton Lake
Beaver Lake	Garner Lake	Long Island Lake	Smoke Lake
Beaver Mines Lake	Ghost Lake	Lower Kananaskis Lake	Smoky Lake
Birch Lake	Glenmore Reservoir	Lower Mann Lake	Snipe Lake
Birch Lake North Bay	Goldeye Lake	Magee Lake	Sosony Mobil Lake
Black Mud Lake	Goodfish Lake	Manatokan Lake	South Heart Reservoir
Blood Indian Creek Reservoir	Goose Lake	Marie Lake	Spring Lake
Bonnie Lake	Gooseberry Lake	Mary Gregg Lake	Square Lake
Bridge Lakes	Gosling Lake	May Lake	Star Lake
Buck Lake	Grande Cache Lake	Medicine Lake	Steele Lake
Buffalo Lake	Grassy Island Lake	Mere Lake	Strubel Lake
Burnstick Lake	Cache Lake	Millers Lake	Sturgeon Lake
Burnt Lake	Cache Lake	Mink Lake	Swan Lake
Cache Lake	Gull Lake	Lake Minnewanka	Sylvan Lake
Cardinal Lake	Hanmore Lake	Minnie Lake	Telford Lake
Caribou Lake	Hasse Lake	Miquelon Lakes	Touchwood Lake
Chain Lakes	Hastings Lake	Mitchell Lake	Tucker Lake
Charlotte Lake	Hilda Lake	Mitsue Lake	Twin Lakes
Charron Lake	Hubbles Lake	Moose Lake	Upper Kananaskis Lake
Chestermere Lake	Isegun Lake	Mud Lake	Upper Mann Lake
Chickakoo Lake	Ironwood Lake	Muir Lake	Utikuma Lake
Chickenhill Lake	Island Lake	Muriel Lake	Victor Lake
Chin Lakes	Isle Lake	Nakamun Lake	Vincent Lake
Clairmont Lake	Jack Fish Lake	Nipisi Lake	Wabamun Lake
Claude Lake	Jarvis Lake	North Buck Lake	Wakomao Lake
Coal Lake	Jessee Lake	Obed Lake	Watt Lake
Cold Lake	Johnnys Lake	Oliver Lake	Whitefish Lake
Cooking Lake	Joseph Lake	Outpost Lake	Whitney Lake
Cow Lake	Kehiwin Lake	Payne Lake	Wildhorse Lakes
Crane Lake	Keho Lake	Peanut Lake	Willow Lake
Crimson Lake	Kinky Lake	Pierre Greys Lakes	Winefred Lake
Crowsnest Lake	Lac Cyr	Pigeon Lake	Wizard Lake
Dakin Lake	Lac la Biche	Pine Lake	Wolf Lake
Dillberry Lake			

In 2004, AGS worked in the Cold Lake area to better understand the near-surface geology and hydrogeology. The project used bathymetry data of lakes in the area by incorporating the topography of lake beds into the Shuttle Radar Topography Mission digital elevation model. This produced a continuous, more realistic digital representation of the ground surface and allowed AGS to better interpret glacial tectonism, bedrock topography and shallow groundwater flow.

The usefulness of these data led to an effort to capture all of the remaining lake bathymetry maps for Alberta. AGS obtained hydrographic survey maps for 169 lakes, digitized them, and digitally modelled them to produce a continuous bathymetry surface for each lake. In November, we released these GIS datasets on the AGS website. You can view the list of available lakes at www.ags.gov.ab.ca/publications/lake_bathymetry.html. There are 3 datasets for each lake: lake shorelines and bathymetry contours, both in shapefile format, and a lakebed grid, in ASCII format.

We also published in November a set of GIS data layers depicting the surficial geology of the Calgary urban area. These data were originally published as four 1:50 000-scale maps in Bulletin 53 by S.R. Moran. Four layers comprise this GIS dataset: surficial materials polygons (DIG 2008-0874), polygon contacts (DIG 2008-0876), linear landforms (DIG 2008-0873) and surficial veneer (DIG 2008-0875). To download the data, go to www.ags.gov.ab.ca/publications/publications.html. ❖

Groundwater Program — Edmonton-Calgary Corridor

Alberta Geological Survey and Alberta Environment are collaborating to map and understand the province's groundwater resources. A team of geologists and technologists will

- map the extent of the major aquifers;
- characterize the physical properties of the aquifers;
- quantify the chemical properties of the water within these aquifers;
- assess current groundwater use associated with these aquifers; and
- predict the long-term effects on groundwater and surface-water resources when using groundwater from these aquifers.

The team plans to complete this work within the next 15 years.

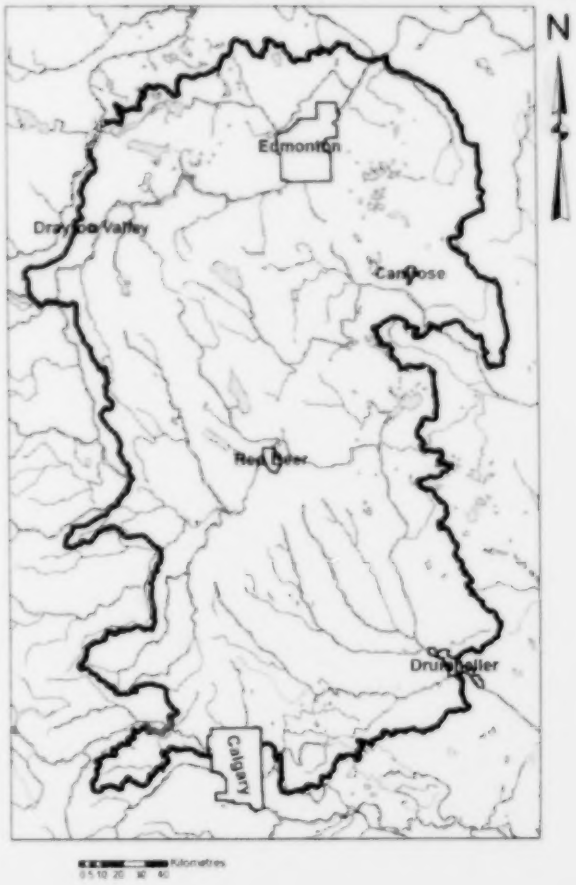
We selected the Edmonton-Calgary Corridor (ECC) as the first study area because it is one of the fastest growing areas in Canada in terms of population and industrial development. As both population and industry are expected to grow significantly, people's demand for water will also increase. The team began work in the ECC in 2007 and will complete it by 2011.

During the first year of this four-year project, the team has made progress in

- developing the aquifer mapping and characterization methods;
- assembling currently available data;
- planning field programs to fill gaps in our knowledge of groundwater resources; and
- devising and presenting concepts of how groundwater is moving through the province.

Developing the Aquifer Mapping and Characterization Methods

Groundwater that can easily be extracted from wells is found in porous and permeable units called aquifers. Aquifers will have variable volumes, areal extents, depths below surface, hydraulic conductivities, porosities, compositions, grain sizes and connections to surface water bodies. With an area as large as the ECC, let alone the province of Alberta, it becomes important to develop efficient and effective methods to map out and characterize these aquifers and their properties. The team has made significant progress in using existing information and innovative techniques, such as airborne-geophysical surveys, to map out the extent of aquifers.



Map showing the first study area selected.

Assembling Currently Available Data

Information from previously installed water wells, newly drilled test holes, oil and gas wells, and geophysical surveys allow us to map the extent and characteristics of aquifers. Many of these sources of information can also provide insight into groundwater use. Many different groups within the government possess groundwater data. We are approaching these groups to supplement our groundwater databases.

Planning Field Programs to Fill Gaps in Our Knowledge of Groundwater Resources

Despite the large databases of groundwater information, there are gaps in our understanding that need to be filled through the collection of new data. The team is planning field programs to gather the required data. Currently, the team is planning a water-sampling program to better understand water quality within the study area, and an

aquifer-testing program to better understand the physical properties of aquifers within the study area.

Devising and Presenting Concepts of How Groundwater is Moving Through the Province

To predict how groundwater is moving, the team will design a model to predict the effects of groundwater pumping on groundwater and surface-water resources. These predictions will be used to decide on how best to manage water resources.

Groundwater models can be complex and require expertise to properly set up and simulate groundwater flow under different conditions. The team's goal will be to present the results of the modelling in a clear manner.

Alyssa Barker, Joanna Chan and Tony Lemay logging core at site ECC 2008-01.

Josh Bishop and Elizabeth Kravontka (two AGS summer students) examining core at site ECC 2008-03.

A thick coal accumulation (centre portion of core) at drill site ECC 2008-02.

Drill site ECC 2008-06.

Deformed bedding at drill site ECC 2008-11.

What's Next?

In the next two years, the team will build on the successes of the first year of the study to

- map the extent of the major aquifers in the ECC;
- characterize the physical properties of the major aquifers in the ECC;
- describe the water chemistry of groundwater within the major aquifers in the ECC;
- assess current groundwater use patterns within the ECC;
- predict long-term effects of groundwater use;
- develop tools and methods for water managers to use groundwater modelling results; and
- prepare to map and understand groundwater resources in the next study area. ❖

Recently Released Publications and Podcasts

Digital Datasets

DIG 2008-0877, -0878, -0879, -0880 Surficial Geology, Fort Chipewyan (NTS 74L) (GIS data).

DIG 2008-0881 Surficial Geology of the Wapiti Area (NTS 83L) (GIS data).

DIG 2008-0882, -0883 Surficial Geology, Rocky Mountain House (NTS 83B) (GIS data).

Earth Sciences Report

ESR 2007-09 Mapping Millimetre-Scale Ground Deformation Over the Frank Slide and South Peak of Turtle Mountain, Alberta, Using Spaceborne InSAR Technology. 24.6 MB PDF. $20.00.

Open File Reports

OFR 2008-06 Geological Evaluation of Garnet-Rich Beaches in East-Central Alberta, with Emphasis on Industrial Mineral and Diamondiferous Kimberlite Potential. 15.5 MB PDF. $20.00.

OFR 2008-07 Turtle Mountain Field Laboratory: 2007 Data and Activity Summary. 6.79 MB PDF. $20.00

Story Contact Information

The following AGS staff members may be contacted for further information on their articles or citations.

AGS Begins Regional Saline-Aquifer Mapping in Alberta's Industrial Heartland	Tony Lemay	(780) 422-2619
AGS Helps Re-Open the Frank Slide Interpretive Centre	Corey Froese	(780) 427-2872
New GIS Data Available	Joan Waters	(780) 427-2779
Groundwater Program — Edmonton-Calgary Corridor	Tony Lemay	(780) 422-2619
An Interactive Map for the Turtle Mountain Monitoring Project	Dennis Chao	(780) 427-0107

Staff may also be contacted via e-mail by entering the author's first name.last name@ercb.ca

Comments and suggestions for Rock Chips may be sent to Maryanne Protz at maryanne.protz@ercb.ca

An Interactive Map for the Turtle Mountain Monitoring Project

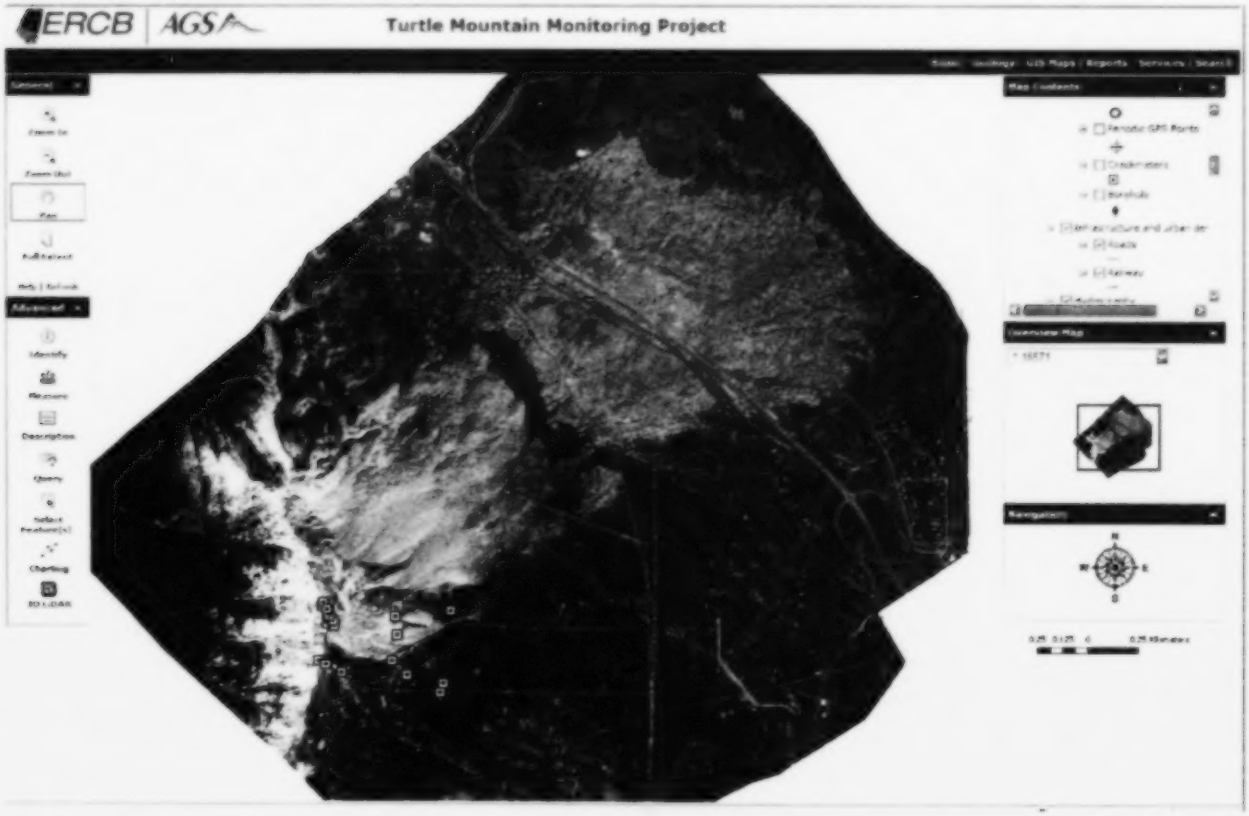
Since 2005, Alberta Geological Survey (AGS) has been responsible for a warning system and studies on the South Peak of Turtle Mountain, the site of the 1903 Frank Slide. AGS activities include annual maintenance and repairs of instruments on the mountain and annual review of data trends. We also study how portions of the mountain are moving. With all of these data available, we're looking at new ways to present them to the public, in addition to traditional hard-copy reports and maps. More people are using Web-based applications to view geospatial information (e.g., Google Earth, Microsoft Virtual Earth, MapQuest); therefore, AGS is exploring how to present its data in a similar format.

With Geographic Information System (GIS) software, one can view all spatial data generated from the Turtle Mountain Monitoring Project. GIS is a computer-based system for managing, storing, querying, analyzing, modelling and displaying map database information. When GIS data and functionality are available via the Internet, the system is referred to as Web-GIS.

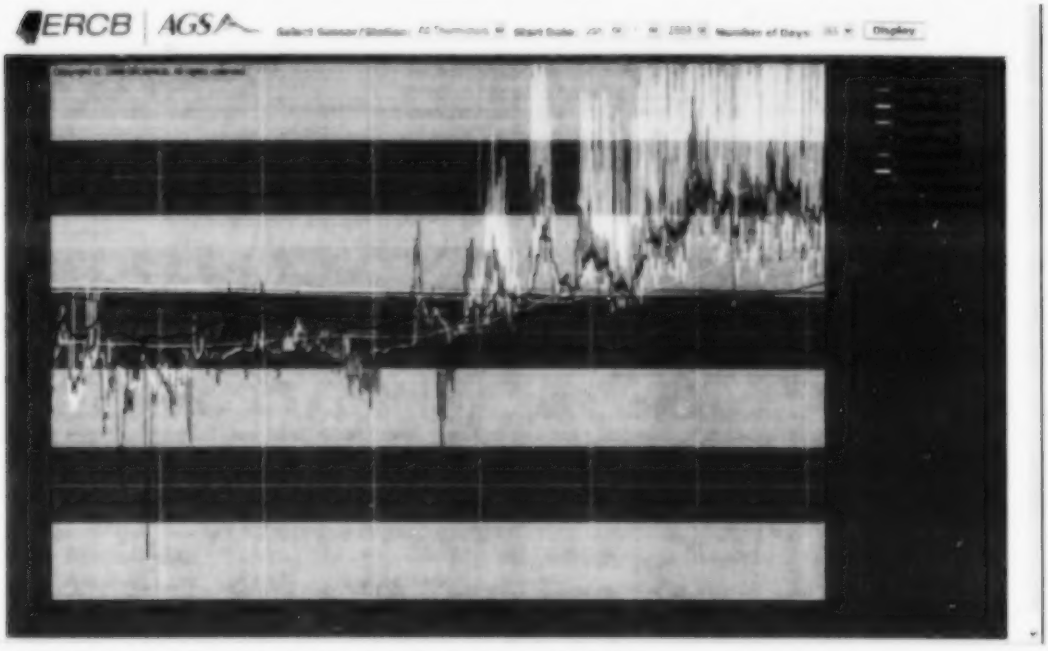
Using Web-GIS technology, AGS created an interactive map for the Turtle Mountain Monitoring Project. This map gives a bird's eye view of the area that includes high-resolution images, information from previous hazard assessments, locations of settled areas, available geological information, extent of the 1903 rockslide and locations of monitoring equipment.

The map has general and advanced tools. The general tools are for navigation. Users can zoom in, out or pan around the map, show the full extent of the area, refresh the map, and get help on using the tools.

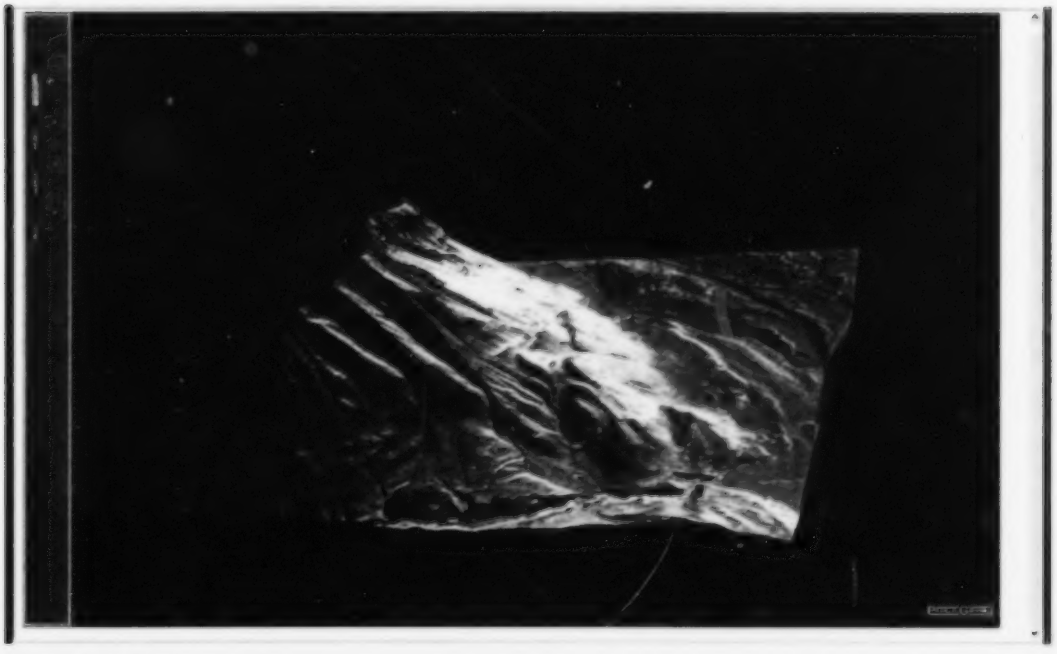
The advanced tools are for accessing information on a specific map layer. Users can measure distances, get information on monitoring instruments, create graphs and plots, and display or manipulate a 3D model of Turtle Mountain.



Turtle Mountain Monitoring Project interactive map at http://turtle.ags.gov.ab.ca/Turtle_Mountain.



A chart showing thermistor vs. temperature from January to August of 2008.

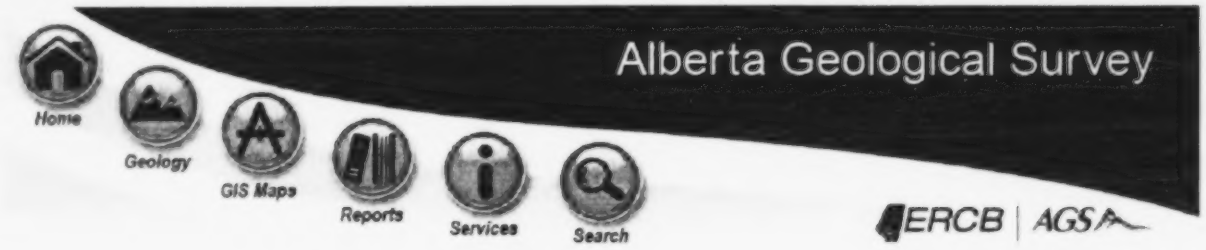


A 3D display of Turtle Mountain.

In addition to the tools, there are three panels on the right side. The **Map Content** panel allows users to turn map layers on or off; the **Overview Map** panel allows users to display map layers at any scale; and the **Navigation** panel allows users to pan using the compass.

Alberta Geological Survey launched this Web-GIS application as part of the newly redesigned Turtle Mountain web pages, which have details on the monitoring and studies on the mountain. This application will provide up-to-date information on ongoing AGS activities on Turtle Mountain. ❖

Check Out This Web Page (www.ags.gov.ab.ca/MCRF)



Assessment Reports

MCRF location

SHARE

Mineral Core Research Facility

Mineral Core Samples

The Mineral Core Research Facility (MCRF) has more than 650 core samples on deposit from various mineral exploration projects in Alberta.

Core Sample Information

Read our PDFs to get detailed information on core holdings.

- original coordinates
- core orientation
- core recovery
- related publications

Core Locations NEW

Core Details & Publications NEW

Please read the original mineral assessment reports for data validation.

Mineral Assessment Reports

View Assessment Reports

Assessment reports record the geological, geochemical, geophysical and other exploration work completed on mineral claims (exploration permits). They provide an essential source of data for prospectors and geologists. Assessment reports are useful to subsequent property holders because they provide information to advance the prospect, rather than duplicating work already done.

Due to regulations, assessment reports remain confidential for one year after submission. Alberta Geological Survey has reports dating back to 1949. Many can be **downloaded** for free or you can contact our **Information Centre** to view and purchase hard copies.

Facility

Access is by appointment only. To book, contact Rob Natyshen at 780 466 1779.

The facility is part of a large warehouse complex with a high head area for core storage, two viewing/display areas and a visitors office. The area is 1235 square metres plus 310 square metres on the mezzanine. The MCRF contains more than 58,572 metres of mineral core and 17,000 rock samples.

Location

The Mineral Core Research Facility is in the Capital Industrial Park, 4504 Eleniak Rd. (63 Ave), Edmonton, Alberta.
View map

Role and Mandate

The Alberta Geological Survey (AGS) assists the Alberta government's Department of Energy in administering the Metallic and Industrial Minerals Regulations of the Mines and Minerals Act for the Province of Alberta. Under these regulations, the Crown collects mineral core and rock samples from companies working on mineral permits and makes these materials publicly available for use by prospectors, mineral exploration companies and academia for mineral exploration and research purposes.

Activities

Mineral core and rock samples are selected by an AGS geologist and exploration companies are directed to send these materials to the MCRF in Edmonton. The core is catalogued, stored and is available for logging or sampling by the public, industry or the scientific community.

Who Uses the Mineral Core and Rock Samples?

Mineral exploration companies and prospectors account for about half the users requesting to see and sample the core. Federal and provincial geologists account for another third of the users and are the primary users of the rock samples. Graduate students and university staff request access to both core and rock samples every year and materials have even made it onto Canadian television programs.

History and Background

A diamond drillcore selection and storage program was started by the Alberta Energy and Natural Resources Department in 1979. The submission of core drilled during exploration for metallic or industrial minerals is required by the Metallic and Industrial Mineral Regulations, as part of the exploration approval process. The AGS was contracted to prepare a facility to store and manage the core and to select core and samples on behalf of the Department. The original facility was called the MESS (Mineral Exploration Core and Sample Storage). In the early 1980s, a research component was added to the function and the facility came to be called the Mineral Core Research Facility (MCRF). When the AGS was transferred to Alberta Energy in 1995, the activity ceased as a contracted function and became an integrated activity of the Mineral Agreements Branch and the AGS. In 1996, the AGS moved to Energy Resources Conservation Board where it continues to deliver the basic functions described in the Regulations.

Location of Mineral Core Research Facility. To view core, please book an appointment with Rob Natyshen at 780.466.1779.

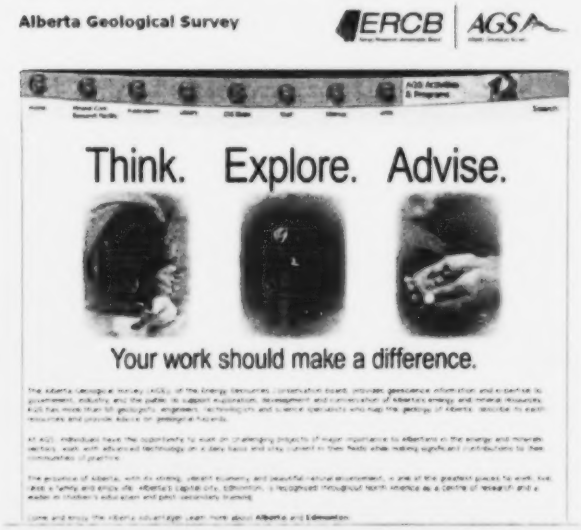
Conferences Involving Alberta Geological Survey

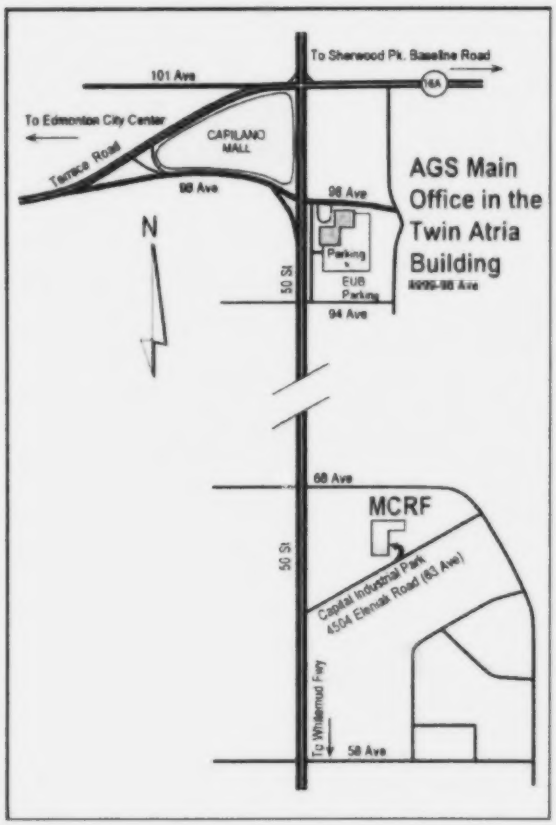
PDAC 2009
March 1 to 4
Metro Toronto Convention Centre - South Building
Toronto, ON

MEG
April 21 to 24, 2009
Ramada Hotel, Downtown
Calgary, AB

Check Out This Web Page

www.ags.gov.ab.ca/employment.html





AGS Locations

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The Alberta Geological Survey Information Centre is located at the address above and may be contacted at
Tel: (780) 422-1927
E-mail: AGS-Info@ercb.ca

Our Mineral Core Research Facility (MCRF) is located at
4504 Eleniak Road
Edmonton, Alberta

For information on the MCRF or to book a visit, contact Rob Natyshen by phone at (780) 466-1779 or by e-mail at Rob.Natyshen@ercb.ca